1 1. (previously presented):A method for detecting atmospheric disturbances
2 including the steps of:
3   providing infrasound frequency magnitudes of received noise spectra;
4   comparing said infrasound frequency magnitudes to an infrasound
5 threshold; and
6   determining existence of said atmospheric disturbances with the
7 utilization of infrasound frequency magnitudes that exceed said threshold.

1 2.(original):A method for detecting atmospheric disturbances in accordance
2 with claim 1 wherein said providing step includes the steps of;
3   extracting noise at frequencies below a specified frequency from said
4 received noise spectra to provide an extracted noise spectra;
5   filtering said extracted noise spectra to obtain infrasound at frequencies
6 below a predetermined infrasound frequency; and
7   detecting magnitudes of infrasound frequencies below said
8 predetermined infrasound frequency.

1 3.(original):A method for detecting atmospheric disturbances in accordance
2 with claim 2 wherein said extracting step includes the step of activating said
3 filtering step when magnitudes of said extracted noise spectra exceed a
4 preselected threshold.

1   4.(amended): A method for detecting atmospheric disturbances in accordance

2   with claim 3 wherein said comparing step includes the steps of:

3   coupling infrasound obtained in said filtering step to an atmospheric

4   disturbance detector and to a threshold computer;

5   computing a threshold in said threshold computer by averaging

6   magnitudes of infrasound received prior to reception of infrasound generated

7   by an atmospheric disturbance; <u>and</u>

8   coupling said computed threshold to said atmospheric disturbance

9   detector~~; and~~

10   —— ~~establishing an existence of an atmospheric disturbance when~~

11   ~~infrasound coupled to said atmospheric detector exceeds said computed~~

12   ~~threshold~~.

1   5.(original): A method for detecting atmospheric disturbances in accordance

2   with claim 4 wherein said detecting step includes the step of establishing an

3   existence of an atmospheric disturbance when infrasound coupled to said

4   atmospheric disturbance detector exceeds said computed threshold.

1   6.(previously presented): A method for detecting atmospheric disturbances in

2   accordance with claim 5 wherein said providing step further includes the step

3   of positioning sound sensors in a manner to sense sound from a noise

4   generating source and providing infrasound magnitudes respectively

5   associated with said sensors.

1 7.(original):A method for detecting atmospheric disturbances in accordance
2 with claim 6 wherein said sound sensors are positioned in a row perpendicular
3 to a foot print of a glide slope of an approaching aircraft with predetermined
4 spacings therebetween.

5 8.(original):A method for detecting atmospheric disturbances in accordance
6 with claim 7 wherein said row of sound sensors is placed at a runway middle
7 marker.

1 9.(original):A method for detecting atmospheric disturbances in accordance
2 with claim 7 further including the step of comparing extracted noise of a
3 preselected sound sensor in said row of sound sensors to said preselected
4 threshold.

1 10.(original):A method for detecting atmospheric disturbances in accordance
2 with claim 6 wherein said positioning step includes the step of locating parallel
3 rows of sound sensors, each containing a multiplicity of said sound sensors,
4 between runways at an airport.

1 11.(original):A method for detecting atmospheric disturbances in accordance
2 with claim 6 wherein said positioning step includes the step of locating a
3 column of said sound sensors, with predetermined spacings therebetween,
4 along a center line of an airport runway, a first sound sensor of said column
5 being placed at a predetermined location.

1   12.(original):A method for detecting atmospheric disturbances in accordance
2   with claim 11 wherein said extracted noise is obtained from noise spectra
3   received by at least one sound sensor including said first.

1   13.(original):A method for detecting atmospheric disturbances in accordance
2   with claim 12 wherein said filtering step and said detecting step are performed
3   in sound sensors subsequent to said at least one sound sensor, said filtering
4   step being activated by said extracted noise obtained from noise spectra
5   received at said least one sound sensor.

1   14.(original):A method for detecting atmospheric disturbances including the
2   steps of:
3   sensing atmospheric noise to obtain noise signals;
4   filtering said noise signals to eliminate signals at frequencies above a
5   predetermined frequency and providing signals at frequencies within a band
6   of frequencies below said predetermined frequency;
7   comparing amplitudes of signals at frequencies in said band below said
8   predetermined frequency to a first preselected threshold;
9   determining a representative amplitude and representative frequency
10 for signals at frequencies in said band below said predetermined frequency
11 that have amplitudes which exceed said first preselected threshold;
12   comparing said representative frequency to a predetermined frequency
13 threshold;
14   comparing said representative amplitude to a second preselected
15 threshold when said representative frequency exceeds said predetermined
16 frequency threshold ; and
17   indicating when said representative amplitude exceeds said second
18 preselected threshold.

1   15.(original):The method of claim 14 wherein said filtering step includes the
2   step of placing signals having frequencies within said band of frequencies in
3   frequency bins and determining amplitudes and phases of signals in each bin.

1   16.(original):The method of claim 15 wherein said amplitude comparing step
2   includes the step of comparing said amplitudes of signals in each of said
3   frequency bins to said first preselected threshold.

1   17.(original):The method of claim 14 wherein:
2   said sensing step includes the step of
3   providing first and second sensors to obtain first and second noise
4   signals, respectively;
5   said filtering step includes the steps of
6   establishing a first band of signals having frequencies below said
7   predetermined frequency in said first noise signal and a second band of
8   signals having frequencies below said predetermined frequency in said
9   second noise signal; and
10   utilizing said first and second bands of signals to estimate an angle off
11 a reference of said atmospheric disturbance and to estimate a range to said
12 atmospheric disturbance.

1   18.(original):The method of claim 17 wherein said utilizing step includes the
2   steps of:
3   computing electrical phase differences between signals in said first
4   band and signals in said second band; and
5   converting said electrical phase differences to said angle off said
6   reference.

1   19.(original):The method of claim 18 wherein said computing step computes

2   phase differences between signals in said first band and signals in said

3   second having equal frequencies.

4   20.(original):The method of claim 17 wherein said establishing step includes

5   the steps of:

6   placing signals having frequencies within said first band into first

7   frequency bins and determining phases and amplitudes of signals in each of

8   said first frequency bins;

9   placing signals having frequencies within said second band into second

10   frequency bins and determining phases and amplitudes of signals in each of

11   said second frequency bins.

1   21.(original):The method of claim 20 further including the steps of:

2   determining phases differences between signals in bins of said first

3   band and signals in corresponding bins of said second band, a bin in said first

4   band and a corresponding bin in said second band comprising a bin set,

5   thereby obtaining a bin set phase difference for each of said bin sets; and

6   utilizing said bin set phase differences to estimate an angle of said

7   atmospheric disturbance from a reference direction.

1   22.(original):The method of claim 21 wherein said utilizing step includes the

2   steps of:

3   averaging signal amplitudes in bins of said first band with signal

4   amplitudes in corresponding bins of said second band, to obtain a bin set

5   average amplitude for each set of corresponding bins;

6   multiplying bin set average amplitudes by said bin set phase

7   differences, respectively, to obtain set products of bin phase multiplied by bin

8   average amplitude;

9   summing said set products over all bin sets, to obtain a sum of set

10   products;

11   summing said set average amplitudes over all bin sets to obtain a sum

12   of set average amplitudes; and

13   dividing said sum of set products by said sum of average amplitudes to

14   obtain said estimate of said angle.

1   23.(original):The method of claim 20 wherein said comparing amplitudes step

2   includes the step of

3   comparing amplitudes of signals in said first band and amplitudes of

4   signals in said second band to said first preselected threshold and removing

5   signals from bins, in said first and second bands, with amplitudes that do not

6   exceed said first preselected threshold; and further including the steps of:

7   combining amplitudes of signals in said first and second bands that

8   exceed said first preselected threshold at a first location, to obtain a first

9   combined amplitude signal and combining amplitudes of signals in said first

10   and second bands that exceed said first preselected threshold at a second

11   location, to obtain a second combined amplitude signal;   using said first and

12   second combined amplitude signals to estimate range to said atmospheric

13   disturbance.

1   24.(original):The method of claim 23 wherein said combining includes the

2   steps of:

3   computing rms sum of signal amplitudes at said first location in said first

4   and second frequency bins to obtain rms sum signals A_1 and B_1, respectively;

5   and

6   computing rms sum of signal amplitudes at said second location in said

7   first and second frequency bins to obtain rms sum signals A_2 and B_2,

8   respectively.

1   25.(original):The method of claim 24 wherein said using step includes the

2   steps of:

3   averaging A_1 and B_1 to obtain an average signal S_1, and averaging A_2

4   and B_2 to obtain an average signal S_2;

5   forming a ratio $r = S_1/S_2$;

6   noting a difference in position of said first location and said second

7   location, said difference in position being $X\cos\theta$, where X is a distance from

8   said first location to said second location and θ is said angle off said

9   reference; and

10   estimating range R to said atmospheric disturbance from $R = X\cos\theta/(r - 1)$.

1   26.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 1 wherein said providing step includes the steps of;

3   extracting noise at frequencies below a specified frequency from said

4   received noise spectra to provide an extracted noise spectra;

5   filtering said extracted noise spectra through a low pass filter to obtain

6   infrasound at frequencies below a predetermined infrasound frequency; and

7   comparing magnitudes of said infrasound at frequencies below said

8   predetermined infrasound frequency to a preselected magnitude.

1   27.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 26 wherein said preselected magnitude is that of a

3   preselected wind velocity.

1   28.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 26 further including the steps of:

3   selecting a signal in said extracted noise spectra, thereby providing a

4   selcted signal;

5   comparing said selected signal to a second predetermined threshold;

6   and

7   deactivating said low pass filter when said signal exceeds said second

8   predetermined threshold.

1   29.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 26 wherein said providing step further includes the

3   step of positioning sound sensors in a plurality of parallel rows positioned

4   perpendicular to and centered on a foot print of an aircraft arrival glide slope.

1   30.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 29 wherein each row contains at least 3 sensors.

1   31.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 1

3   wherein said providing step includes the steps:

4   obtaining infrasound below a predetermined infrasound frequency,

5   thereby providing extracted infrasound; and

6   detecting magnitudes of said extracted infrasound.

1   32.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 31 wherein said obtaining step includes the steps of:

3   extracting noise at frequencies below a specified frequency from said

4   received noise spectra to provide an extracted noise spectra; and

5   filtering said extracted noise spectra to obtain said extracted infrasound.

1   33.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 31 wherein said providing step includes the step of

3   positioning a noise sensor and said determining step includes the steps of:

4   delaying extracted infrasound for a predetermined time interval, thereby

5   providing delayed extracted infrasound;

6   predicting a time of arrival at said noise sensor of an atmospheric

7   disturbance causing a presently extracted infrasound with the utilization of

8   said delayed extracted infrasound and said presently extracted infrasound.

1   34.(previously presented) A method for detecting atmospheric disturbances

2   in accordance with claim 33

3   wherein said predicting step includes the steps of:

4   determining magnitudes of said delayed extracted infrasound and said

5   presently extracted infrasound;

6   establishing a ratio of said magnitudes;

7   providing a square root of said ratio; and

8   utilizing said square root, said time delay, and velocity of said infrasound

9   to predict said time of arrival.

1   35.(previously presented) A method for detecting atmospheric disturbances
2   in accordance with claim 33 further including the steps of:
3   producing a signal when magnitudes of said extracted infrasound
4   exceed said infrasound threshold for a predetermined time interval;
5   coupling said signal to a gate to which said time of arrival is also
6   coupled; and
7   supplying said time of arrival through said gate when said signal is
8   received.

1   36.(previously presented) A method for detecting atmospheric disturbances
2   in accordance with claim 32 wherein said filtering step provides infrasound
3   signals at frequencies below a preselected infrasound frequency and said
4   determining step includes the steps of:
5   finding a bandwidth of said infrasound signals having amplitudes greater
6   than a preselected amplitude;
7   calculating a mean frequency and rms amplitude for signals within said
8   bandwidth;
9   comparing said bandwidth, said mean frequency, and said rms
10   amplitude to respective predetermined thresholds; and
11   providing an alarm when said respective thresholds are simultaneously
12   exceeded over a specified time interval.